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PROCEEDINGS

OF THE

American Forestry Association

AT THE

Thirteenth and Fourteenth Annual Meetings,
December, 1894, and January, 1896,
at Washington,

AND AT THE SUMMER MEETINGS AT

Brooklyn, N. Y., and Springfield, Mass.

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NOTICE.

The proceedings of the American Forestry Association have hitherto been published irregularly, the volumes not being numbered. With the improved financial condition of the association, and its increased membership, a regular issue of the annual proceedings in future appears warranted, and it seems desirable to designate, by numbers, not only the coming volumes but also those previously issued. The present volume is, therefore, numbered XI. The series of previous volumes includes the following publications. Of these, those marked * are out of print.

*Vol. I.—Proceedings of the special meeting at Montreal, August, 1882. Papers read before the meeting printed separately by the Canadian Government in the Ontario Fruit Growers Report. (The proceedings of the first annual meeting, that held at Cincinnati, April 25-29, 1882, were not published in pamphlet form.)

*Vol. II.—Proceedings of the second annual meeting, at St. Paul, August, 1883. Also, Forestry Bulletins No. 1 (May, 1884); No. 2 (September, 1884); No. 3 (January, 1885).

*Vol. III.—Proceedings of the special meeting at Washington, D. C., May, 1884, and third annual meeting, at Saratoga, New York, September, 1884.

*Vol. IV.—Proceedings of the fourth annual meeting, held at Boston, September, 1885.

*Vol. V.—Proceedings of the fifth annual meeting, held at Denver, Colorado, September, 1886. (Newspaper report.)

*Vol. VI.—Proceedings of the sixth annual meeting, held in Springfield, Ill., September, 1887.

Vol. VII.—Proceedings of the seventh annual meeting, held at Atlanta, Ga., December, 1888, and of the eighth annual meeting, held at Philadelphia, Pa., October, 1889.

Vol. VIII.—Proceedings of the summer meeting, held in Quebec, September, 1890, and of the ninth annual meeting, held in Washington, D. C., December, 1890.

Vol. IX.—Papers read at joint session of the American Economic Association and the American Forestry Association, held at Washington, D. C., December, 1890.

Vol. X.—Proceedings at the tenth, eleventh, and twelfth annual meetings, held in 1891, 1892 and 1893, and of the special meeting at the World's Fair Congress in Chicago in 1893.

STATE REPORTS

ON THE

CONDITION OF FORESTS AND FORESTRY.

[Submitted at the Springfield, Mass., Meeting, September, 1895.]

NOTE.—The following reports were presented at the annual meeting of the American Forestry Association, held in Springfield, Mass., in September, 1895. It has been thought best to print these reports in one pamphlet, in order to bring together the interesting information they contain. It is to be regretted that it was impossible to print the majority of the reports in full, but the limited space made abridgement necessary. In all such cases an effort has been made to retain all specific information, matters of opinion being sacrificed to this end.

Mr. Eliot's paper on the Boston Reservations, printed herewith, will, it is hoped, prove an inspiration and a model to other communities in creating similar pleasure grounds.

ALABAMA.

By Dr. Chas. Mohr, Vice-President, Mobile.

Forests of Longleaf Pine *(Pinus palustris)* prevail largely all over the southern half of the State. The lumbering industry centers in the coast pine belt, which is estimated to cover about 13,000 square miles. If to this area that of the forests of the central pine belt, and the outlying tracts in the northern part of the State is added, the forests of Longleaf Pine, of industrial importance in Alabama, roughly estimated, extend over 11,000,000 acres. Fully fifty per cent. of this area can be said, at the present date, to be occupied exclusively by the Longleaf Pine. The development of the resources of these forests dates from the opening of the railroad lines leading from the commercial centers of the North to the Gulf ports. It is chiefly during the past fifteen years that the manufacture of lumber and the export of hewn and square timber has assumed larger proportions from year to year. In the census report of 1880 the cut of Longleaf in Alabama was estimated for that year at 245,396,000 feet b. m. In the past year (1894) the cut in this State has reached nearly 400,000,000 feet—including almost one-half of the timber exported from Pensacola. The exports from Mobile of 22,500,000 feet b. m. in 1880, increased steadily to 162,667,000 feet in 1893, the sum of the total shipments from this port. Such increase has, however, not taken place in the upper part of the pine belt; on the contrary, the dismantled mills at the earliest established sites of the lumbering industry, along the great railroad lines, clearly denote the exhaustion of the surrounding forests.

The lowering of the standard in the classification of the logs, admitting, of late years, as merchantable timber such as are scarcely over 10 inches in diameter, combined with the practice followed generally, at present, to bleed trees of such small size for their turpentine, involves the destruction of the younger timber at the stage of most active growth, and leaves little upon which to depend for future supplies. The scanty balance that has escaped the axe, together with the second

growth of this pine, of a more tender age, is sure to succumb to the fires which, year after year, scour these forests. This work of destruction, proceeding almost without any interruption, leaves no chance for their natural renewal. Although the consequences of the disappearance of these magnificent pine forests begin to make themselves felt in some localities, it is witnessed by the people with the utmost apathy.

During the past year about 100 turpentine stills have been in operation in Alabama, resulting in the production of 24,091 casks of spirits of turpentine and 85,620 barrels of rosin. Owing to the exhaustion of the forests contiguous to the highways of commerce the production of these stores has been on the decline since the end of the last decade. With the better prices ruling for the past two years, a slight increase has taken place. Since it has been demonstrated by the U. S. timber tests that the bled timber has in no way suffered in its physical properties, the practice of extracting the turpentine before the timber is removed to the mill is gaining ground in Alabama, and the production of naval stores will receive a new impetus.

Of Cypress timber vast stores are yet remaining in the deep alluvial swamps of the lower Alabama and Tombigbee rivers and their tributaries. The timber most easily accessible has been largely cut. The manufacturers of Cypress lumber and shingles are entirely dependent for their supply of logs upon freshets, causing a sufficient rise of water to permit the floating of the timber from the swamp to the streams. In consequence, this branch of industry is frequently subjected to interruption. The manufacture of sawn Cypress shingles has greatly increased in the last seven years. During this time seven shingle mills have been established at Mobile, of a daily capacity averaging 125,000 pieces. On account of the scarcity of logs, most of these mills have remained idle for a length of time, their output in the aggregate for the past year amounting to less than one-third of their capacity.

Extensive tracts of hardwood forests cover the bottom lands, in a great measure but slightly touched by the axe, mostly Swamp White Oak or Basket Oak, Spanish Oak, Ash, Red Gum, and some Poplar. In 1894, 319,216 pipe staves of the best White Oak reached the Mobile market, against 36,000 in 1883; 354,500 cubic feet of hewn White Oak and 966,233 cubic

feet of assorted hardwood timber were marketed the same year at this port. The largest supplies of White Oak, White Ash, Yellow Poplar and Hickory, with various other kinds of hardwood, exist in the remoter valleys and coves of the basin of the Tennessee river. The mills of larger capacity, situated on the banks of the Tennessee river, ship their product mostly by rail to Northern markets, and the numerous mills situated on the railroad lines ship their wagon stock and lumber to the markets of the East. The groves of Red Cedar, principally confined in Alabama to the Tennessee valley, support a cedar pencil mill, several manufactories of red cedarware, and almost alone furnish the timber for piling and wire poles needed in the Southwest. Under the existing demands these supplies of Northern Alabama are, however, rapidly approaching exhaustion.

Beyond the enactment of laws against the firing of the woods, and stock laws, optional with the counties, the State has done nothing to promote the preservation of the forest, and no organization exists with the aim to create an active interest in the forestry conditions of the State.

CALIFORNIA.

By Abbot Kinney, Vice-President, Lamanda Park.

The forest reservations of California and Oregon include a greater area than all other similar reservations in the United States put together, and yet they are far from covering the forests that a rational forest system would demand.

The forests of California are practically confined to the mountain ranges. Those confluent at the northern portion of the State correspond to a forestal confluence of the Sierra and coast ranges. As these mountains divide and encircle the great interior valley of California, so also do the forests. As far south as Chico the valley and foothill conditions are favorable to forest growth, especially to oaks, and where, as in some

of the enclosures of General Bidwell at Chico, nature has had full sway, a growth of oak has taken possession, which may properly be called "forest."

Throughout the northern part of the State there are several Indian reservations, viz.: Klamath, Hoopa and Round valley, but there are no forest reservations. Nor is there any forest management. The government land system is so defective in relation to the needs of modern lumbering that fraud is invited, and has been generally practiced.

The great lumbering interests of California are largely confined to this section. The forest growth of the coast range is, in the north, mainly pine and Douglas Spruce (*Pseudotsuga taxifolia*). On the interior, or valley side, the oaks predominate, and take more and more a grove-like growth.

About Humboldt the Red-wood (*Sequoia sempervirens*) takes entire possession of the coast front of the mountains. This district extends south to Santa Cruz and divides with the Douglas Spruce section of Oregon the honor of being the greatest producer of merchantable timber to the acre in the world. The Tan-bark Oak, rapidly being exterminated (*Q. densiflora*), and the beautiful Madrona (*Arbutus menziezii*) are confined to the coast ranges. There is no forest reservation on the coast range except the insignificant Trabuco, in Orange county, far to the south. After passing Santa Cruz no forests of commercial importance exist. The mountains are mainly covered with dense brush or chapparal. On the higher ranges there are pines and spruce, and toward the interior oaks again in grove-like plantations assume possession.

The entire coast range from San Francisco north was gone over by the extinct State Board of Forestry, under my direction, and the forests platted by sections. The maps of this work are accurate, and may be found in the Second and Third Forest Reports of that Board.

At the same time the forests of Southern California were platted. These are the only accurate maps of any portion of the California forests. Other maps, however, exist.

The great Sierra back-bone of the State has a grand forestal growth as far south as the Tehachepi, with extension by the arboreal islands in the San Barnardino and San Jacinto ranges.

The principal commercial growths are Yellow Pine (*Pinus*

ponderosa), Sugar Pine (*Pinus lambertiana*), Incense Cedar (*Libocedrus decurrens*) and Douglas Spruce and fir. There are several species of tamaracks, pines, firs and cedars in the range, a full popular and botanical description of which was made under my direction by Prof. Lemmon, and which can be found in the Second and Third Reports of the Board.

The Big Trees (*Sequoia gigantea*) are scattered through the central and southern portions of the Sierra in island-like groves. The original Calaveras and Mariposa groves are small. Those in Fresno and Tulare counties are large.

Commencing at the northern line of the Yosemite, the whole block of the Sierra forest to the south as far as Walker's Pass is now a splendid forest reserve. It comprises the Yosemite, the Sequoia National Park, the General Grant and the Mt. Whitney Military Reservation. There are also two Indian reservations, the lines of which touch the forest reserve.

The irrigation waters of Central California flow from this Sierra forest reserve. A considerable portion of this reserve is patroled by Federal cavalry. As far as the patrol extends the former destructive forest fires have not recurred.

There is, I think, no district in this country better adapted to an educational establishment for all forest questions: timber exploitation, forest fires, pasturage of both sheep and cattle, torrent action, mining and irrigation reservoirs and the preservation of springs, together with tree treatment under widely varying conditions, from summits of 14,000 feet to low alluvial plains, and with a rainfall from 60 inches or more in some parts, to an uncertain precipitation of 3 or 4 to 10 inches in others.

The two official forest reserves of San Gabriel and San Bernardino form one national reserve, taking in the Sierra range, from which nearly all the flood and irrigation waters of Los Angeles, San Bernardino, Riverside, Ventura and Orange counties have their source.

The present main producing areas of Southern California look to this range for both dangerous flood and for summer water. Most of the range is ragged and very difficult of access, and so has found a protection in its topography. A little mining is done here and there, and in the San Bernardino section considerable timber is taken out, as is also the case in the adjacent unreserved San Jacinto mountains.

There is in this southern reservation absolutely no guardianship or attempt at protection of any kind. A company or two of troops, pending the establishment of some permanent forest system, could do great good here. The experience of the officers of the cavalry patrol of the Yosemite indicates that the soldiers were improved not only as soldiers, but as men, both physically and morally, by their forest duty.

The people of the State are very generally in favor of a forest policy and of the forest reserves and their extension. This feeling is strong and universal amongst the irrigators and the business towns supported by them. The miners are all favorable except where they fear exclusion from the reserves. The great timber firms now favor the forest policy. The sheep men do not like it. This interest is the only one that cannot be rendered unanimous for a rational forest system in California.

CANADA.

By Sir Henry G. Joly de Lotbinière, First Vice-President, Point Platon, Quebec.

In treating of the state of our forests and their management, I will ignore those belonging to private individuals (as they are but an insignificant portion of the whole), and limit myself to our public forests.

The government retains the ownership of our forests; it holds them in trust for the Crown, which means the people, and is answerable to Parliament for their good management.

The right of cutting the timber is leased at *public auction* for a limited period, under conditions the non-fulfillment of which puts an end to the lease.

In commenting on our forestry system, the great American forester, the late F. B. Hough, in his Report to Congress, draws attention to the fact that "although the system of management of the Canadian forests is crude in its provisions, and destitute

of any policy tending to secure the growth of new forests, it has one redeeming feature, as the title to the land itself remains vested in the government, and, after the expiration of the first temporary leases, under which the native timber is cut, it will be available for any course of management that experience may suggest. This last consideration prepares the way for any system of forestry that the wants and resources of the country may, in future, demand, and, even without a system, the natural growth of a new forest where the old one has been cut away, especially where the spruce timber prevailed, is, in many places, bringing forward a supply for future use, although much less effectually than under proper care would be obtained.

The public forests belong to the provinces in which they are situated, except those of the northwest, which belong to the Dominion, or Central Government. It is a satisfaction to find that it can appreciate the wisdom of the policy so strongly recommended by Mr. B. E. Fernow, head of the Forestry Branch of the U. S. Department of Agriculture—the preservation and protection of the forest at the head of rivers. We have in our statute book a law providing "for the preservation of forest trees on the crests and slopes of the Rocky Mountains, and for the proper maintenance throughout the year of the volume of water in the rivers and streams which have their source in such mountains."

In the provinces of Ontario and Quebec, the Department of Crown Lands under whose care the public forests are placed, has rather a difficult task before it in dealing with the conflicting claims of the lumberman and the pretended settlers who apply for a lot on the Crown lands, not with the intention of cultivating it, but merely to cut down and sell all the valuable timber and then abandon the lot. There are strict regulations to prevent that, and a certain time is allowed to the lessee of the limit to remove the merchantable timber off the land sold to the settler for a nominal sum. Attempts have been made to adopt a careful *classification* of public lands under two heads: Lands fit for agriculture, which alone ought to be open to settlement—lands unfit for agriculture, which ought to be carefully closed against settlement and kept in forest. The best timber lands, especially the *pineries*, are generally totally unfit for agriculture;

it is a cruelty to decoy settlers there. How many hard-working men have wasted the best part of their lives in trying to get a living out of such poor soil, and are tied down to it for want of means to move away with their families; the only result of their work being the ruin of a fine forest and their own ruin!

The lease of timber limits expires every year on the 30th of April, but all lessees who have complied with the regulations are entitled to renewal. This acts as a strong inducement to take proper care of their timber limits.

The transfer of a timber limit by a lessee can only be made with the approval of the Commissioner of Crown Lands, and is subject to a bonus.

The lessee must furnish every year to the Department a sworn statement from his foreman or person in charge of the number and description of all pieces of timber cut by him, including what has been left in the woods as not fit for the market.

The lessee is not allowed to cut pine trees measuring less than 12 inches, nor spruce less than 9 inches, at the stump, but since the cutting of spruce for pulp wood is tolerated, I think the minimum is much below 9 inches. Of course, our spruce forests, instead of reproducing themselves, as Mr. F. B. Hough anticipated in his above-quoted report, will soon vanish, if the government continues to allow the cutting down of the young trees for pulp wood.

We have a number of forest and fire rangers to protect the forests from pillage and from fire. The expense incurred for the service of the fire rangers is equally shared by the lessees of the timber limits and by the government. Of late there have been very few serious forest fires.

There is very little square timber manufactured now, compared with a few years ago; it is a great saving of valuable stuff which was wasted in the operation of squaring, amounting to nearly one-third of the merchantable lumber in the trees. There is now much more waney pine produced than square pine, with much less loss of valuable material.

The official returns for the last year of the revenue of the public forests (timber dues, ground rent and bonuses for transfer of timber limits) show $980,497.40 for Ontario and $823,-906.92 for Quebec.

Both these provinces have adopted quite lately the policy of

setting aside vast extents of forest amounting to millions of acres, for national parks, but the measures necessary for their proper management are not yet satisfactorily completed.

There is a great deal of sawn spruce produced in New Brunswick, but I have no report of their Crown Land Department by me. The same system of leasing timber limits prevails there as in Ontario and Quebec. We have duly licensed cullers who have to pass an examination and perform their duty under oath. They are appointed to measure and cull the timber cut on the Crown lands, but apart from that the lumber shipped to England is culled and classified by them, and their decision (subject to appeal) is in nearly every case satisfactory both to buyer and seller. Appeals are very rare. They do not often cull the sawn lumber sent to the United States. I think the mill owners do their own culling in nearly every case.

I have often noticed in the United States papers devoted to the lumber interest complaints arising from the want of a regular system of culling lumber; the question deserves serious consideration from both buyer and seller.

Our pine, especially the finest quality, is getting scarce; it does not reproduce itself as the spruce does, and the latter, owing to the immense quantities of young trees cut for the pulp wood factories, will get scarce before long.

COLORADO.

By Geo. H. Parsons, Colorado Springs.

The forests of Colorado occupy about two-thirds of the State, or the mountainous portion, whose slopes they cover, from the edge of the plain up to timber line at the altitude of eleven thousand feet. They are entirely coniferous, from the pines and cedars on the foothills, through the grand firs, to the storm-tossed spruces on the lofty peaks. They are not dense and continuous, but are broken by beautiful valleys and open, undulating spaces, abounding with flowers, to which are well applied the general name of parks. The growth is heaviest

on the northern slopes, where the trees are sheltered from the drying influence of the sun, and where the snows remain longer and the young growth is better protected. Much of this forest is so difficult of access that its own location is sufficient protection. But at lower elevations and near settled localities or mining regions, the forest has been practically swept away, leaving only a few scattered trees to indicate what had been. In many parts of Colorado this destruction is for all time, for the dryness of the atmosphere and the nature of the soil will prevent natural reforestration. But it is a pleasure to note in many portions of the mountains a very successful attempt by nature to replace the forest that had been destroyed. Beautiful groves of young conifers are pushing ahead most vigorously, and seedlings are springing up wherever they are given the least opportunity.

All the rivers and streams of Colorado rise among the mountains and flow east or west to the Atlantic or Pacific. Their sources, and the thousands of springs which supply them, are therefore under the protection of the forests, and whenever these are removed the diminution in volume of the streams becomes at once apparent. Therefore, in this arid region of Colorado, where no crops are raised successfully without irrigation, and where every drop of water is exceedingly valuable, the work of the forest in preserving the springs and streams, and holding back the water as in reservoirs, is of inestimable value. Colorado is more of an agricultural State than is generally supposed, for the products from agriculture, in all its branches, amount to the large sum of $65,000,000, nearly twice as much as the mineral product, and this great industry is entirely dependent upon the maintenance of the forest.

No State in the Union is so dependent upon its forests as Colorado; yet how little has been done to preserve them. All that has been accomplished is the work of a few men, opposed at every step. Out of the forty millions of acres of forest in the State, 3,103,360 acres have been set apart as forest reserves, and about two million acres more were being examined for this purpose when the present administration stopped the work. There has not been as yet any practical result from these reserves, for nothing is done to look after them and the timber thieves work over them unmolested, notwithstanding repeated protests sent to Washington.

INDIANA.

By Prof. J. Troop, Vice-President, Lafayette.

With the exception of a few localities where the railroads have not yet reached, the timber of the State is somewhat scattered. There is a large area which has not yet been touched to any extent, comprising the whole of Brown and portions of Monroe, Jackson and Bartholomew counties. This section is very rough and hilly, consequently the railroad companies have found it a difficult matter to get at it. Brown county is made up of hills and magnificent timber; and it has been suggested that the State ought to buy the whole county and maintain a magnificent park there. Then, towards the southwest portion of the State, taking in a portion of Floyd, Harrison, Crawford, Dubois and Pike counties, is another hilly region covered with magnificent forests. A portion of this section will in time make fine forest land, but it will never be suitable for general farming, as it is too broken. Over in the southeast part of the State, through Ohio, Switzerland and Dearborn counties, is another section which has not been disturbed very much as yet.

Twenty-five years ago the Wabash and White river valleys were noted for their magnificent timber, as published by Dr. Ridgeway, but now they are practically stripped.

So far as I am aware, no attempt has been made, or at least has been successful, to plant trees to any extent. Last year our State Horticultural Society took the matter up and made an attempt to get a bill before our legislature looking towards the better care and development of our forests, but, like a good many others, it failed to receive consideration. I will say, however, that public sentiment is being aroused in regard to this matter, and something will be done before very long.

In regard to wood industries, the last report of the Bureau of Statistics for Indiana says: "Twenty-one localities are represented by 163 establishments engaged in the manufacture of articles in which wood is the chief material. The wood industries of the State take high rank in the list of Indiana's manufacturing enterprises. The 163 establishments reporting to this Bureau have invested in grounds, buildings and machinery, $4,615,430. The annual cost of materials used is $9,994,589, and a total annual product valued at $18,403,267."

IOWA.

By Prof. L. H. Pammel, Ames.

The original forest area of Iowa occupied perhaps 5,000,000 or 6,000,000 acres. Prof. C. S. Sargent states that "the broad bottom lands along the river of the eastern part of the State once bore heavy forests of broad-leaved trees. Farther west the tree growth was less heavy, in the narrower bottoms. All over the State, however, forests lined the streams and often spread, especially in the southwestern counties, over the uplands. Since the first settlement of the State the forest area has increased by the natural spread of trees over ground protected from fire, and by considerable plantations of Cottonwood, Maple and other trees of rapid growth made by farmers to supply fuel and shelter.

"The natural forests have been everywhere largely culled of their most valuable timber, and in spite of their increased acreage are, in their commercial aspect, in danger of speedy extermination. Manufacturers of cooperage stock and others using Iowa timber report great scarcity and general deterioration of stock" (Tenth Census Report, Vol. IX., p. 560).

Considerable of this timber has been removed, and the work of destruction is going on.

The State of Iowa contains the following streams: On the west, the Missouri; on the east, the Mississippi; in the interior, the Iowa, Des Moines, Cedar, Maquoketa, Coon, Skunk, Turkey, Sioux and numerous smaller rivers and streams. These were in early times all skirted with timber, the timbered area varying in width from one-half to four and five miles. The best belt of timber occurs along the Mississippi, especially in Southeastern Iowa, where in some places it extends thirty miles west from the river, though in most cases it is considerably less.

Iowa does not lack in indigenous species. Many of the northern species, like Shellbark Hickory (*Hicoria ovata*), Bitternut (*Hicoria minima*), Bur Oak (*Quercus macrocarpa*), Red Oak (*Q. rubra*), Black Oak (*Q. velutina*), White Oak (*Q. alba*), Green Ash (*Fraxinus lanceolata*), Hard Maple (*Acer saccharum*), Soft Maple (*A. saccharinum*), Boxelder (*A. negundo*), Basswood (*Tilia americana*), White Elm (*Ulmus americana*), Red Elm (*U. pubescens*), Butternut (*Juglans cinerea.*)

We also have a great many Southern species in the southern part of the State, and in some cases extending well up along our rivers—Kentucky Coffee Tree (*Gymnocladus dioicus*), Honey Locust (*Gleditsia triacanthos*), Swamp White Oak (*Quercus platanoides*), Pin Oak (*Q. palustris*), Laurel Leaved Oak (*Q. imbricaria*), Chinquapin Oak (*Q. acum inata*), Redbud (*Cercis canadensis*), Ohio Buckeye (*Aesculus glabra*), Mockernut Hickory (*Hicoria alba*), Pecan (*Hicoria pecan*), Black Walnut (*Juglans nigra*). Some of these reach northwards beyond the limits of Iowa.

We have only two, perhaps three, conifers, native in Iowa—*Pinus strobus, Juniperus virginiana,* and possibly *Abies balsamea.*

The White Pine is a familiar tree everywhere in Iowa. Very few of the conifers, and only in a few places, have been tested under forest conditions.

Of our western and northern conifers the *Pinus ponderosa, Pseudotsuga taxifolia, Picea mariana, Picea canadensis, Abies balsamea, Abies fraseri* (of the Alleghany mountains), *Abies concolor, Picea engelmanni, Larix laricina, Picea pungens, Pinus divaricata, Pinus resinosa, Tsuga canadensis* do admirably in many parts of Iowa; most of the species over the entire State.

The fact is to be noticed that the chief source of danger to forest trees in Iowa is the fact that our woodlands are being used for pastures very extensively; the underbrush is trimmed out and cattle turned in. Sometimes twice as much stock is turned into the forest as it can support. The leaf mould which is needed in a forest rapidly disappears. The forest cannot hold the moisture, and consequently springs and small streams become dry; the forest trees themselves die. I have seen numerous cases where fine half-grown oaks died undoubtedly because of the tramping of cattle and drying up of the surface of the soil. The roots of plants are largely governed by the mechanical condition of the soil. An annual in the case of drought may adapt itself to changed conditions, but a tree producing an abundance of roots close to the surface of the soil cannot change. Its roots are not so viable. A soil, moist close to the surface when covered with leaf mould, will cause roots to develop close to the surface. Sudden change of the surface conditions by removal of brush and leaf mould must be injurious to the root development.

MAINE.

By Jno. E. Hobbs, Vice-President, North Berwick.

If one examines Colton's Map of Maine he will notice that almost one-half the State projects into the Dominion of Canada—the northern limit of the State being about 40 miles further north than the city of Quebec.

This region contains the most of what is known as the "Wild Lands" of Maine, which have a total area of 9,666,727 acres, which is almost an unbroken forest.

These wild lands are drained by the large rivers of the State, which furnish the route for the logs to the mills. They are owned in large tracts by a few private individuals and corporations, and are valued by the State assessors, for the purposes of taxation, at $18,210,894, or about $2.00 per acre, for the actual lumber-producing acreage.

The total cut of logs on these wild lands has been 500,000,000 feet per annum for several years—much the greater part being spruce, for the old pine timber is now nearly exhausted, small bodies of it remaining only in localities at present inaccessible. To secure the present supply lumbermen are constantly extending their operations nearer to the headwaters of the streams. They construct new dams and build roads every year, in order to make available timber lands that could not before be operated.

In some localities lumber railroads have been constructed for the same purpose. The tendency throughout this lumbering region is to cut smaller trees than formerly. This is shown in the diminished size of the logs as compared with those which were formerly floated down the large rivers. It takes about three times as many trunks to make one thousand feet as it did 40 or 50 years ago.

The manufacture of wood pulp has increased enormously in the State in the last few years, so that today Maine takes the lead of all the other States in this industry. Much smaller trees

are used for making pulp than can be profitably manufactured into lumber, so that the production of spruce lumber seems likely to be diminished, in the near future, as rapidly as that of pine has been diminishd in the last 30 years. Some of the largest owners of these wild lands have expressed the opinion to me that our spruce forests, as a source of lumber supply, would be practically exhausted before 20 years at the present rate of cutting.

The same tendency to cut smaller trees for saw logs than formerly prevails in lumbering on the woodlands which are connected with the farms in the southern part of the State. The farm woodlands aggregate about 3,000,000 acres.

At least one-third of our people are dependent upon the products of our forests for employment, and their exhaustion as a source of lumber supply must result in a large decrease in our population.

Our people are gradually waking up to the fact that much of our forest wealth is being squandered by wasteful cutting and the lack of intelligent management of forest lands, and some of the largest owners of timber lands are taking measures to prevent such waste.

Fire is the greatest enemy of forests. Our people have realized the importance of protecting them from that terrible scourge, and since the enactment of the Maine Forestry Law in March, 1891, Maine has suffered less from forest fires than during any other like period in her history. The most of those that have occurred since this law was passed have resulted from sparks from locomotives.

It is to be feared that a great conflagration may occur in time of drought on the line of the Canadian Pacific Railway, which for 130 miles is through an unbroken forest, unless that corporation uses greater care in the future than it has in the past in guarding against it.

The posting of fire notices along all our lakes and streams frequented by sportsmen and hunters, as required by Section 17 of the forestry law, has been very effective in preventing fires.

An organization called the Maine Lumbermen and Land Owners' Association was formed at Bangor in February of this year. The objects of this association are to better protect, preserve and promote the growth of the forests of Maine; to devise

and adopt the best possible means for protecting our forests against destruction from fire, insects and a wanton and wasteful use of the axe; to ascertain the best, most judicious and most economical method of cutting logs; to secure a fair, honest and equitable system of scaling the same, and to do all other things that may be necessary to protect and foster the forest interests of the State. Ex-Governor D. F. Davis, of Bangor, is president of the organization, and Wilson Crosby, of Bangor, is treasurer. This is a movement in the right direction, and is worthy of imitation by the lumbermen and land owners of other States.

MISSOURI.

By B. F. Bush, Independence.

The principal forests of Missouri lie south of the Missouri river, although there are considerable forests along the Mississippi river and along the Missouri river. There are scarcely any forests worthy of mentioning in the northern part of the State. Along the Missouri and Mississippi rivers there are large bodies of timber of considerable importance, consisting mainly of Cottonwood, White and Red Elm, Sycamore, Linden, Boxelder, Bur Oak, White Oak, Red Oak, Chinquapin Oak, Walnut, Cherry, Black Sugar Maple, etc. These regions, often comprising large, fertile bottoms where the timber attains a great size, are much sought after by pioneer farmers, who, in their eagerness to clear up the land and get big crops of corn, lease large tracts of timber land, and either cut down and burn the trees on the ground, or else girdle all the larger trees to kill them, where they remain standing for years. No thought is given to the timber at all, except to get it out of the way as quickly as possible, and I have never heard one person in these regions deplore the reckless destruction of the timber. In the southern, southwestern and southeastern parts of the State there are vast tracts of forests almost untouched as yet, but

doomed to follow the way of the timber of the older parts of the State. In the southwestern part of the State the principal timber is Post Oak, Black Oak, Red Oak, Walnut, etc. A great deal of land has been bought here by non-residents, who are called "speculators" by the residents, and in some cases many thousands of acres in a tract are owned by these people. The residents are extremely apathetic as to the destruction of the timber going on around them, and seem to vie with each other in cutting off the "speculators'" timber, saying, in defense of this, that a non-resident has no right to own land there. The principal commercial use that the timber has been put to is for railroad ties and bridge and dimension timbers.

The southern part of the State is densely timbered, and contains pine, White, Red, Post, Bur and Black Oaks, cedar, etc. In this region there is considerable government land yet, and the greatest desire the people have is to cut government timber. Much of the land is quite broken and rough, and is very cheap; therefore much of it is now being settled up. The usual way of clearing land here is simply to cut down and windrow the trees, and then burn them. No thought is given to preserving the timber, but everyone studies how to overcome the difficulties of clearing the trees off their land. The commercial uses of timber in this section are numerous, for pine is manufactured into all kinds of bridge and building material. Post Oak is made into railroad ties, and White and Bur Oaks are made into bridge and railroad timber.

The southeastern part of the State has probably the highest development of forests in the eastern United States, for here all species are extremely abundant and of prodigious growth, reaching an abnormal size in such trees as White, Red, Bur, Cow, Water, Spanish, Post and Willow Oaks, Sweet Gum, Cypress, Pignut Hickory, Cottonwood, Walnut, White Ash, Common Hackberry, Mulberry, Persimmon, etc. In this region there is a large amount of timbered lands owned by non-residents, such as the Michigan Lumber Co., Northern Lumber Co., and other lumber companies, who are holding their vast forests for the purpose of supplying their own wants later on, or for better prices of lumber when the greater part of our timber has been destroyed. The residents seem to think that these people have no right to hold these lands, and therefore never

lose a chance to cut and haul off the best of the logs there are on the land. No thought of saving any timber enters their mind, any more than a thought of saving water occurs to a resident along the Mississippi river. In this last region the principal commercial uses to which timber has been put are for stave-bolts and heading-bolts, of which hundreds of car loads are sent out every month; railroad ties, of which millions are sometimes sold to one man alone; bridge and wagon timber; tobacco box material for St. Louis, of which I have seen millions of feet in one pile; railroad timber for the North, of which the Great Northern Railroad alone has one man here buying all the time, and I have seen train loads of it going. Numerous other industries in lumber are carried on here. I have often asked why they took no interest in preserving the forests, and have invariably received the answer that there would be plenty of timber for them, and after they were gone they did not care.

My opinion is that the people who should be the most interested in preserving the forests, who derive their living from it and from the soil, which it keeps in productive condition, are the most indifferent to forest destruction.

NEBRASKA.

By Dr. Charles E. Bessey, University of Nebraska, Lincoln.

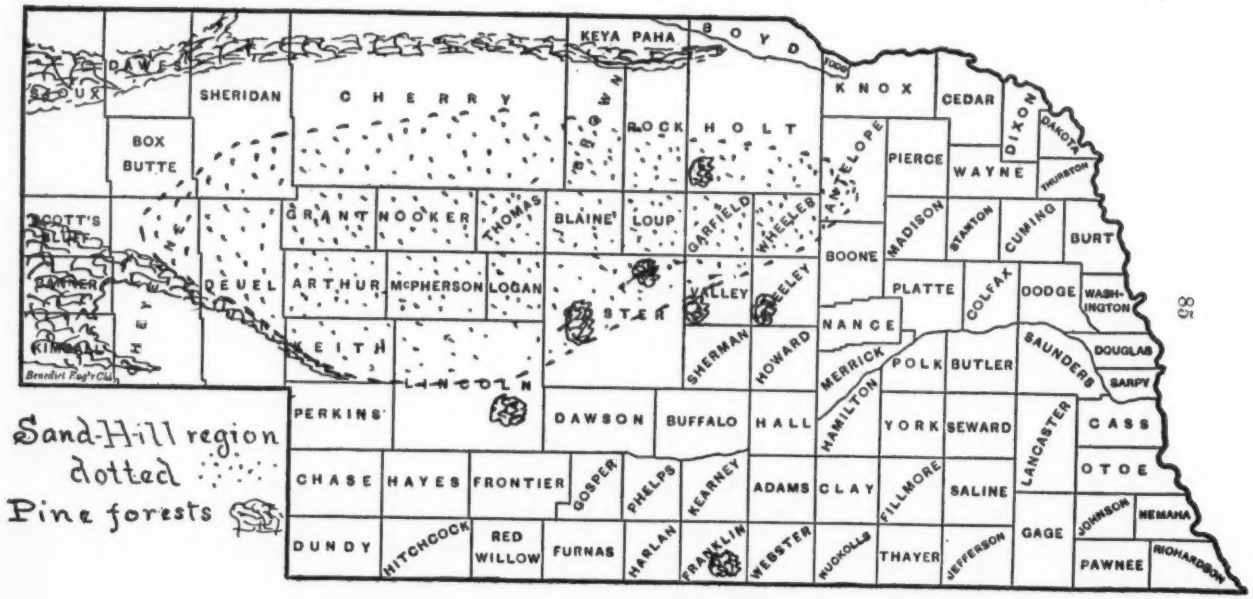
In the meeting of the Nebraska State Board of Agriculture, held last January, I discussed some of the problems connected with the Sand Hill region of Nebraska, and the former distribution of pine forests, a portion of which I should like to bring before this association at this time.

I will call your attention to that very interesting part of Nebraska known by the name of the Sand Hills. They cover from 15,000 to 20,000 square miles, and extend from Holt and Antelope counties on the northeast to Deuel and Keith on the

southwest, and in some parts of this area they extend from the Niobrara river to the Platte. (See Map.) We here use the term "Sand Hills" to denote a geographical region with certain peculiarities, just as we use the term Black Hills, or Great Plains, or Western Prairies, and it is not to be supposed that there is absolute uniformity throughout the region in the present case any more than in the others cited. It is thought by many persons who know little of the region that the Sand Hills consist of a barren waste of useless sand thrown up into hills, with no more water than may be found in the hills of the great Sahara of Africa. Nothing could be further from the truth than this notion. It is a significant fact that the Sand Hills give rise to many living streams, all the branches and tributaries of the Loup river having their origin in this region. No desert sends out streams of water, but, on the contrary, deserts are usually the sinks into which rivers pour their waters only to lose them forever. Let us misunderstand this wonderful region no longer. Let us cease to look upon it as akin to a desert. It is no desert. It is a region of deep-lying springs, whose waters feed the streams which issue from it. It is probably the only part of the State in which the destroying hand of the pioneer cannot harmfully affect the volume of water in its rivers. Man can never destroy the great bed of sand mulch which nature has laid over the region we know as the Sand Hills.

A somewhat prolonged study of the Sand Hills has led me to the inquiry whether they have always been treeless. They bear no little resemblance to many regions still covered with pines in other portions of the United States. I have traveled for days through pine forests in Michigan, which, if denuded of trees would be much like our Sand Hills, both as to soil and the surface configuration. It is not impossible that forests formerly covered the Nebraska Sand Hills, as in places they still do the sand hills of Michigan.

As we pass up the canyons of the larger streams we find trees. These are mainly of eastern species, and it is possible that they migrated hither and never spread from their narrow canyons. This appears to have been the opinion of Hayden and many others of the early explorers of the plains, and I think it is still the prevailing belief that these hills were always desti-



Sand-Hill region dotted

Pine forests

tute of forests. Let us, however, consider the following facts:

1. *There are many isolated canyons which contain trees.* This suggests that either (*a*) the seeds of these trees must have been distributed by birds or wind, or (*b*) a former more general distribution. It is not probable that birds or winds carried the seeds to these canyons. The physical barriers are often too great to warrant us in assuming that birds were the agents in distributing the seeds from which sprang the forests in isolated canyons. Nor can we assume that wind carried the seeds. We are forced to assume that the forest areas must have formerly been more extended, sufficiently so to connect these isolated canyon forests with one another.

2. *There are in these canyons Western as well as Eastern trees and shrubs.* This fact is significant, as it requires some further explanation of the origin of the present canyon flora. These Western trees and shrubs could not have reached their present stations unless conditions favorable to forest vegetation were formerly much more general than now.

3. *The Yellow Pine of the Rocky mountains now grows with other trees upon the hills of Pine Ridge from the Wyoming line in Sioux county to the Dakota line in Sheridan county.* In this region there are eastern and western trees, and they are growing upon the hilltops as well as in the valleys and canyons. I have seen hundreds of trees of Yellow Pine growing here upon the open hillsides, and upon the most exposed buttes. (See Map.)

4. *The Yellow Pine is now to be found in the canyons of the Niobrara river and its tributaries as far east as the border of Holt county.* In the canyons the pines are growing thriftily, and in many places young trees are springing up abundantly. Several years ago I saw such a new growth of pines in the northern part of Brown county, where the canyons are still full of fine, healthy pine trees. There is nothing in these canyon pines to suggest that conditions are now less favorable than they formerly were, but when one studies the borders of the canyons carefully evidence is not wanting to the contrary. Here trees are found upon the most exposed points and crags, where it would now be practically impossible for these trees to obtain a foothold. Many of them are evidently the veterans holding desperately the stations otherwise practically abandoned by the species in its losing fight against unfavorable conditions. (See Map.)

5. *The Yellow Pine extended eastward along the North Platte river and the Lodge Pole creek, to Deuel county, until the pioneers destroyed them, forty or fifty years ago.* In some places this destruction has been so complete that scarcely a trace now exists of the pine. Nothing could better illustrate the rapidity with which all traces of these trees may disappear than their history along these two western streams. (See Map.)

6. *The Yellow Pine grew in considerable quantities in at least one station on the Republican river until destroyed by the early settlers.* Until within a few months, it was generally supposed that the Yellow Pine never had grown naturally in the Republican valley. Last fall Mr. E. M. Hussong, of Franklin, in Franklin county, found several decaying stumps of pine on the south side of the river near the town, and upon close inquiry learned from the oldest settlers that in the early days small pine trees had been dug up in the canyons and on the bluffs and transplanted to door yards and gardens, while the large trees were taken for fuel and fencing purposes. That the Yellow Pine was a native tree at this point is proved beyond question, and we are led to suspect that an equally careful search will show its former existence in other places in the valley.

7. *In the Loup valley there are Yellow Pines on the South Loup, Middle Loup and North Loup rivers.* These occur in widely-isolated canyons, which have no forest connection with one another. Since all the branches of the Loup head in the Sand Hills, the occurrence of pine on their borders is very suggestive (See Map.)

8. *Logs and fragments of Yellow Pine trees occur here and there in the Sand Hills.* A few years ago an old hunter at Norfolk told me that he had frequently found old pine logs in tramping over the Sand Hills, and that these had often served to make his camp fire. Professor Bruner, a few years ago, saw a settler's wagon in the southwestern part of Holt county on which were fragments of pine wood cut from a pine log found in the hills. Professor Samuel Aughey, who traveled over the State a great deal in the early days before the hunters had used up all these fragments for fuel, states, also, that he has repeatedly found such logs or fragments. (See Map.)

Now, add to the foregoing facts another which but recently came to light and which shows that in places from which all

external traces of the pine have disappeared, they may have existed in comparatively recent times. A few weeks ago, Mr. I. A. Fort, of North Platte, placed in my hands a fragment of a pine stump dug out of the ground in Conroy canyon, in Lincoln county (on section 17, township 11, range 27), about fifteen miles south and eighteen miles east of the city of North Platte. (See Map.) This is about one hundred miles east of its range on the Platte river as hitherto known, and in a locality in which the former presence of pine was suspected. Putting all these facts together, I feel warranted in concluding that the area of Yellow Pine in this State must have been formerly much greater than it is today. I think I can safely say, also, that it is reasonably probable that the Sand Hills were once wooded with the Yellow Pine.

I will not at the present time take up the discussion of the cause of the disappearance of forest growth from Nebraska, preferring to take up that part of the question after the present one is more nearly settled, but I may make the suggestion that the annual fires which swept over the country must have been disastrous to unprotected forests, and that in the canyons only might we hope for any to escape destruction.

The question naturally comes to us whether it is possible to reforest this area. That it would be desirable to do so needs no argument. If we could place across the central portion of the State a belt of forest land from fifty to one hundred miles wide, and one hundred and fifty to two hundred miles long, the beneficial influence upon the State would be almost incalculable. Perhaps it is hopeless to think of such an undertaking. Doubtless it is a project of gigantic proportions, involving, as it does, from five to ten millions of acres. We are probably yet too busy with the work of bringing the cultivable areas under the plow to consider seriously the work of setting aside lands for forest growth, but I have faith in the ultimate ability of our people to grapple successfully even this great undertaking. The steps in the work will have to be something like the following:

1. The setting apart of large areas for forests by the general government, which still owns the greater part of the land in the Sand Hill region.

2. The stoppage of prairie fires over these areas.

3. The enclosure of these lands so as to exclude herds of cattle.

4. The planting of small areas scattered over these forest tracts with hardy shrubs and trees of rapidly-spreading kinds.

5. The careful supervision of these forest areas by competent keepers.

For the first twenty years these forest preserves would be unremunerative, but at the end of this time they would begin to return a little from the sales of fuel and light timber. While it might require half a century before they would be self-supporting, the outlay would become less each year after the first twenty years had passed. Perhaps, too, the expense might be much reduced by the employment of convict labor in the preparation of the soil and the care of the young trees. It certainly would be a much more humane treatment of prisoners to put them at such labor, and there would be the additional advantage that by such a course the work of convicts would not compete with that of honest laborers.

NEW HAMPSHIRE.

By G. H. Moses, Secretary State Forestry Commission, Concord.

With more than three million acres of forest land, comprising every stage of forest development, embracing extensive tracts of the fire-swept ruins left after the lumberman's work, with large areas of second growth, with a constantly diminishing source of supply, with a scanty area of original wood-growth, and with not a square foot of public domain in all this territory, New Hampshire claims to possess every forest condition and to present every forestry problem which can confront those charged with seeing to it that the remaining forest area be more intelligently treated.

On examining the conditions more in detail, the forester in New Hampshire will find five important river basins, the Merrimack, the Connecticut, the Saco, the Androscoggin and the Piscataquis. For forestry purposes only the first four are of importance, no one of which has its source and mouth within New

Hampshire, while one of them is of vital importance to four States. Upon the watersheds of these four rivers congregates our lumber industry, upon the banks of these four rivers have sprung up our largest manufacturing centres, and co-incident with the growth of the lumber industry may be marked the decrease in the water power.

With surprising tenacity and with remarkable ingenuity our lumbermen have penetrated the forests. Each year has carried them farther from the main waterways, and each year has carried the choppers' camp farther back toward and even upon the very headwaters of our great river systems. Logs that were inaccessible twenty-five years ago are now carried to market on logging railroads, which come more numerously to each succeeding legislature with their petitions for charters; and streams which were scorned even by fishermen a dozen years since are now dammed and made to carry their load of logs to the nearest mill.

Natural conditions force New Hampshire to consider herself a lumber-producing State par excellence. She may boast of excellent agriculture, but it is limited by the small area of the State; our creameries cannot alone make us prosperous, nor can our manufacturing, with all its competition and its narrowing margin of profit, be solely depended upon. But our lumber industry boasts a monopoly. There is always a market, the supply is never plethoric, and the New Hampshire spruce today, like the New Hampshire old growth pine of half a century ago, admits no superior. Its long fiber, its purity of color, its ease of manipulation, makes it most durable in the paper mills of New England; and in the lumber markets of the entire East, New Hampshire timber brings the highest price.

These conditions conduce to greed on the part of those who cut the forest, which is another, and perhaps the worst, of our conditions. Knowing his market to be assured; knowing his price to be readily obtained, the lumberman hastens with his annual product from forest to market. The dollar which he may get now is vastly greater in his eyes than any larger sum which he might get later on, or which he might leave for his heirs in place of the stripped and valueless wood lot which has no market value.

We pass at this point from our conditions to our problems.

Indeed, it may be doubted if each of our conditions is not also a problem, presented even in the outlining of the condition. Our first problem, and perhaps all forestry problems, might be reduced to this one, is the matter of convincing our lumber operators that the most money does not lie in the immediate and complete stripping of the growth from timber land.

This is our greatest problem, yet perhaps it is the easiest one to solve. It may be approached in a hard-headed fashion that impresses your shrewd New Englander; it may be dealt with without sentiment; it does not demand rhetoric. It may be demonstrated, and requires chiefly courage. I say it requires chiefly courage in the demonstration of this fact, because it has been the fashion in New England to sneer at forestry's practical claims. Nor has this been without reason; for the forestry movement in New Hampshire at least has thus far proceeded along a sentimental pathway not unmarked by milestones of abuse. Shrewd and suspicious lumbermen have viewed the movement askance; have laughed at its sentiment; have turned a deaf ear to its abuse; have intrenched themselves in the security of their timbered possessions; and have gone on cutting down the forests. Their retreat must now be stormed with argument instead of abuse, in confidence instead of contumely, with logic rather than legislation. The lumberman has no greater anxiety for his possessions than has the forester. Intelligent forestry does not mean confiscation; it means use, perpetual, profitable use of all timbered portions of the earth. Even greed could ask no more. New Hampshire foresters must tell their lumbermen this. They must tell it courageously. Neither laughter, nor anger, nor incredulity should dismay them.

The forestry question in New Hampshire seems to have acquired a new interest. There are many reasons for this, but it is chiefly due, in my opinion, to the agitation of the subject which has been carried on during the last ten years, though there are other reasons. The village improvement societies which sprung up a few years ago and took in hand the work of beautifying New England communities have a share. Yet for the general interest aroused or displayed there can be no adequate cause assigned. It is like the recent revival of patriotism with which we have been blessed, which placed the Amer-

ican flag upon every schoolhouse and sends every theatrical audience home to the strains of the national anthem, and that, too, without forethought.

So we can find no explanation for the awakening of the forestry question. And we say this without disparagement to the students among us who have pondered the question for years, or to the enthusiasts who of late have espoused the cause. Their work has been followed by good results, and they have their reward. Let us not withhold our recognition of the general intelligence. So we find the rudiments of forestry already existing in New Hampshire. Let us count this as one of our conditions. Let us reckon the sporadic allegiance to the "Bangor" rule as one of our safeguards.

There must be more; but how much more none can tell. The absence of forestry in America leaves us without a model. European systems will not serve us here because our people have neither the time nor the inclination, much less do they think of the necessity, for arboriculture, which the old and thickly populated countries of Europe feel. So, then, we must found and develop our own system. And for a bedrock principle we must assert our cause to be the preservation of our forests in all their profit, continuous and increasing.

Now, then, for the method. We need not so much the forcing-bed as the wind-screen. Let us foster the feeling already abroad among our lumbermen that it is unwise to enter at once upon a complete possession of timbered property. Let us show them that a timber lot is a perpetual not an ephemeral source of revenue. Let us convince them that its increment is great, that its use is more profitable than its despoilment. Many lumbermen already preach and practice this; others hope by legislation to prove it. Without a general belief in and adoption of the idea, in the absence of legislation, and the doubt of the wisdom of attempting any, foresters in New Hampshire must wait for the increased prosperity and unconcern of wise lumbermen to show itself in approaching days when virgin forests are no more and new woodlands cannot be bought. Then the intelligent forester and the discriminating lumbermen will reap their reward and New Hampshire will enter upon new forest conditions, unvexed by forestry problems.

NEW JERSEY.

By JOHN GIFFORD, May's Landing, N. J.

The question of fires in South Jersey demands immediate attention. It is the main cause of forest deterioration and its consequences, and the impoverished condition of a large part of the southern interior of New Jersey. There are very few stretches of woodland in this region which have not been thus affected.

The causes of forest fires may be classified as follows: 1. Incendiaries; 2. Careless individuals; 3. Locomotives; 4. Lightning.

The most serious fires are usually those which are purposely set, because set at the proper time in the proper place. An incendiary bent upon mischief waits until the wood is dry and the wind in the desired direction. There are usually two motives back of incendiarism—first, individual gain at the expense of another;—second, revenge. A few years ago it was not uncommon for colliers to fire a wood in order to buy it cheaply. The charred wood is then fit only for charcoal. Owing to the decline of the charcoal industry and the abundance of charred wood in the forest, this is not practical at present. Fires were set in meadowy regions to improve the grass for cattle. Savanna lands are still burnt for that purpose in regions where cattle are turned into the woods. Berry pickers set fire to huckleberry bushes to improve the berry crop. In a couple of years the young growth which follows bears larger and finer berries. Wood thieves, it is said, set fire to the brush and stumps to hide their tracks. There are many people living in the woods of the southern interior who own no woodland, but who gain a livelihood in a variety of ways out of woods which belong to other people. They are mostly berry-pickers, hunters and wood-choppers.

Fires are set out of spite. If a backwoodsman thinks himself wronged by a woodland owner, he "gets even" by touching a match to his woods. It is certain that for several purposes forest fires are set. Such fires do much damage, and such people are difficult to convict.

Woodland owners during forest fire season feel insecure, expecting a fire at any moment. The incendiary may set a fire to injure an enemy, the wind may suddenly change, and many others may suffer in consequence. Several fires in Atlantic county were set last season in the same region several nights in succession.

Second in importance are fires caused by careless individuals. In clearing land, fires escape from burning brush. A large foreign element has come to South Jersey to clear farms. This increases the danger from fires while the land is being cleared. Tramps, hunters and boys with camp-fires, lighted cigars and cigarettes, cause many fires.

Locomotives are also often blamed. It is certain that many fires have been set by sparks from the stack and hot coals from the grate. The majority of the roads are using some care. On some roads engineers are cautioned, safety strips are cleared, and in one instance furrows have been ploughed along the road, and section men usually endeavor to put out the fires which are thus caused. If engineers are careful; if the spark arrester is not withdrawn or poked with holes; if coals are dumped in places prepared for that purpose, and if safety strips are cleared and furrows ploughed along the road and section men are watchful and willing, there is little danger from that source. It is certain that some railroads are using more precautions at present than woodland owners themselves.

Although not common, fires have been set by lightning. Certain species and solitary trees are more apt to get struck than others. There are several indications that a disastrous fire was set last summer in South Jersey by lightning, which struck a solitary tree in a field of dry grass.

The effects of fire may be classed as follows:

1. Destruction of timber and other property; 2. Extinction of valuable species; 3. Impoverishment of soil; 4. Destruction of seeds and game; 5. Consequential damage by affecting industries dependent upon the woods, and by changing moisture, soil and climatic conditions, which are more or less dependent upon a forest cover.

The amount of damage depends, of course, upon the severity of the fire, which in turn depends upon the dryness of the wood, the force of the wind and the nature of the trees and under-

brush. Often everything above ground is killed. The charred boles of hundreds of trees fall and rot in the woods. In low ground, after a fire, fresh, green underbrush soon appears. High land recovers slowly, often remaining bare for many years. There is danger from fires about six months in the year. They are very destructive during the high winds in the spring, when there is little sap in the wood. Dry leaves cover the ground, and many cling to the low oaks. Certain trees are affected much more than others. This depends mainly upon the nature of the bark. Often large pine trees appear to be but slightly affected by a ground fire, which burns the underbrush and leaves on the surface. Bark is a non-conductor of heat, but if the cambium, the active part of the tree just beneath the bark, is affected, the tree dies. Even then, if it happens in spring, the tree appears to be recovering. Dormant buds in the trunk sprout, and fresh green leaves are formed. It is better to cut such trees at once, because they soon die. When the starchy matter in the trunk is exhausted these sprouts wither and die, the tree is invaded by insects, rots and topples over. Even a pine log, if cut in the winter, sends out fresh shoots from dormant eyes in the spring. Even if the tree is not itself directly injured, its supply of nutriment and moisture is affected by burning the undergrowth.

The value of underbrush must not be underrated. Although it smothers young trees, it is useful to forests of larger growth. The amount of mineral matter which a tree absorbs is insignificant. Water is the essential element. In checking evaporation and retarding the flow, undergrowth is often necessary. But the smaller amount of dead wood in a forest the better, since it breeds many kinds of insects, some of which may invade the living trees. The material resulting from decay, however, enriches the soil, so that it is better to burn the dead wood which cannot be utilized. In that way the soil is enriched just the same, the insects are disposed of, and the underbrush is not seriously disturbed. It is easy to see how, therefore, fire in a forest is often useful, if wholly under control and directed by a forester. In old pine woods on upland there is often little underbrush. The ground is covered with a thin layer of pine leaves. Stump holes are common in such woods. When a pine tree is cut or burnt the stump decays, and a hole of consid-

erable size, with many ramifications, is formed. The ground is often riddled with holes from suppressed trees. These drain the water from the surface. This, together with the slight shade of pines and lack of underbrush, accounts for the dryness of the soil and atmosphere in a pine woods. Many trees are soon affected by removing underbrush. The growth of a young oak grove can be easily retarded by trimming the lower limbs and removing the undergrowth.

Since one species is affected more than others, a kind of selection continues, which accounts for the peculiar distribution of trees in certain places. Thick bark trees and trees which produce a vigorous second growth, survive the longest. Pitch pines and oaks, therefore, predominate in South Jersey, while in isolated positions, protected from fires, a great variety of trees may be found. Certain plants, although covered with a thick bark, contain substances in the form of resin, oils and waxes, which are inflammable. Others contain substances which have a tendency to quench fire. The sowing of such plants along safety lines has been suggested to prevent the slow but destructive ground fires.

The White Cedar (*Chamæcyparis thyoides*), the most valuable timber tree in South Jersey, and one of the most valuable in America, although growing in wet swamps, is often seriously damaged by fire. The heat, although it may not burn, is often sufficient to kill the cedar. In unusually dry weather, fires burn for many days in the bed of a swamp. It is often necessary to dig deep trenches in order to check its headway. It destroys cranberry bogs in a similar fashion. For fear of fires, cedar is cut when fit only for rails, hop-poles and laths.

The soil is much impoverished by fire. It is the testimony of a large majority of farmers. The "life" is "cooked" out of it, as they say. The organic matter in the surface soil is often entirely burnt. The surface is bared so that the soil is soon completely leached. Prof. F. H. Storer, in "Agriculture," says: "Within porous soils, nitrates are doubtless formed rather freely, and, as is well known, the nitrates are easily washed out from soils, and are liable to go to waste after every rain that is long continued. They are, in fact, leached out of the soil, and the manure from which they came rapidly wastes away. It is said to be a matter of old and familiar observation in Germany, that

in sandy regions in seasons that are particularly wet the soil may finally be so thoroughly leached that it becomes unfruitful." When we consider the fact that nitrates are easily washed out of the soil, that they are absolutely essential to plant growth, and that they are continually produced during the period of growth from humus by the action of nitrifying bacteria, we can appreciate the damage to light soils by fire. Land thus damaged needs very careful tillage and green manuring before it can produce a crop of value.

When a pine woods, twenty years old, is destroyed, it may mean years before the soil recuperates and seeds are again disseminated. Seeds on the surface are destroyed by fire. Some seeds are seriously affected by slight changes of temperature.

Many animals are also destroyed. In the spring of the year the young are burnt in the nest. It is not uncommon to see many of the smaller animals chased by a fire. By preserving the forest, the animals dependent upon its fruits are preserved.

According to the statements of several seamen, the smoke and fog which it produces was a serious impediment to navigation along our coast last summer.

The total area burned over in South Jersey during the past season amounts to not less than one hundred and ninety-seven thousand acres. No improvement in the forest conditions of a country is possible as long as fires are allowed to burn without any systematic preventive measures. With no assurances whatever against incendiaries and individuals guilty of malicious carelessness, the owners of woodland are at the mercy of chance. Wood is usually cut, in consequence, just as soon as there is a market of any kind. Property in some towns in South Jersey is often endangered. Capitalists hesitate to invest in woodland under such conditions.

If a fire breaks out, it is seldom noticed until of considerable size. The owner of the land coaxes and lures a few men to help him fight it. A fire often burns for some time owing to the fact that competent men cannot be found. Many refuse to fight in the day-time. They wait until evening, when the fire is smoldering. Many fighters do more harm than good. These men are generally not paid. Often they are allowed to cut the dead wood. When this is refused, the land owner is considered mean, and often has diffi-

culty afterward in finding fighters. When allowed to cut dead wood, the privilege is usually abused. When a fire once gains headway in a dry woods, propelled by a strong wind, it is difficult, if not impossible, to check. Such work requires brave, skillful men, familiar with the region, and not chance men picked up here and there. The rapidity of the fire depends, of course, upon the condition of the woods and the strength of the wind. Although these fires are rapid, and although the sparks may fly long distances, a stream, spur of swamp, or even a road, are often sufficient to check their headway. Many fires which are very destructive burn without being noticed for some time.

The method of fighting is by back-firing. After the wind and other conditions have been noted, a party goes ahead, usually to a road, which is always an excellent point of vantage, and burns back toward the fire. If possible, furrows are ploughed. The fires meet, and the force of the main body of fire is checked or diverted. Back-firing on another man's property to save your own, often causes trouble.

This much is certain about fires in South Jersey, that back-firing in the proper way is the most practical method of checking a fire, and that roads are excellent points of vantage. The clearing of roads for some distance on each side, and the burning of safety strips at the proper season, are important steps toward the prevention of fires. Were large tracts of woodland divided into compartments, each compartment surrounded by fire-lines, there would be less danger. South Jersey is such a mass of woods, that when fire once gains headway it travels for miles without meeting with opposition. Fires can be much more easily controlled in South Jersey than in a mountainous region. Sand, which is excellent material to fight with, is, fortunately, plentiful.

Proper policing by a mounted, organized, well-directed force of wardens, is necessary. The territory must be divided into parts of a certain size, irrespective of political divisions, a warden to a district, with the woods, roads and clearings, of which he must become perfectly familiar. He is, in fact, responsible for that district. Located on a prominence with field glasses, one man can control a large area in South Jersey. It must be his duty to enforce regulations and to apprehend and bring to court all offenders. It must be his duty to keep a strict record of fires and other facts concerning the forests of his district.

With a corps of twenty-five brave, skillful men, organized and under one head, fires can be reduced to a minimum, if not stopped, in the southern interior of New Jersey. These wardens must have the power to call on men to help them, when necessary. These men must be under his control, and be paid fair wages for their work. Fighting fire is such a disagreeable and laborious job that there is little wonder competent men are difficult to find who will work for nothing. Experience in other countries shows that the presence of wardens has a strong educational influence. Twenty-five good men for six months of the year could be procured for five hundred dollars each. Allowing as much again for other expenses, twenty-five thousand dollars would cover the cost of such a force. Considering the damage during the past season, there is economy in such a measure.

NEW YORK.

By WARREN HIGLEY, Vice-President, New York.

The State of New York now owns approximately 800,000 acres of forest lands, 750,000 acres of which are in the Adirondack forest, and 600,000 acres of this lie within the Adirondack State Park.

This park, or proposed reservation, includes within its borders an area of 2,807,760 acres, while the whole Adirondack forest covers an area of 3,588,803 acres, and, embracing, as it does, the great Adirondack plateau, forms the most important watershed of the State and one of the most important of the United States.

It was the purpose of the legislature in creating this park to acquire title and control of the lands within its borders, and forever devote them to forest preservation. To this end, small annual appropriations have been made, and the work is going slowly forward, while the values have been steadily advancing.

The work of the State has been greatly aided by private clubs and associations, that now own and control about 1,000,000

acres within the park. These sanitariums, hunting and game preserves and summer resorts, insure the preservation of the forests to the extent of their holdings, for without the forests the lands would be useless for such purposes.

The first legislative action in the direction of the establishment of a State park in the Adirondacks was taken in 1872, when Ex-Governor Horatio Seymour, Wm. B. Taylor, Patrick H. Agan, Verplanck Colvin and Franklin B. Hough were appointed commissioners charged with the duty of "inquiring into the expediency of providing for vesting in the State the title to the timber regions of the Adirondack plateau, and converting the same into a public park; such commissioners to report the result of their labors, together with such suggestions as they may have to present, to the legislature at its next session."

The commissioners made the examination and reported to the legislature recommending strongly the purchase by the State of the forest lands in question.

In 1883 a law was enacted forbidding the sale of all lands belonging to the State and lying within the forest preserve.

In 1885 a general law was enacted providing for the appointment of a State Forest Commission and the better protection of the State forests. This was the most important step yet taken in the direction of true forestry.

In 1890 the Forest Commission, with the approval and concurrence of the Commissioners of the Land Office, was authorized to purchase lands so located within the forest preserve as shall be available for the purposes of a State park, at a price not to exceed one dollar and fifty cents per acre.

Under this authority, together with acquisitions made from tax sales, the Adirondack park or preserve has grown to its present holdings.

Urged by forestry associations and citizens who believed that wise forest utilization is the surest road to permanent forest preservation, the legislature, in 1893, authorized the forest commissioners to sell the spruce and tamarack timber which was not less than twelve inches in diameter three feet above the ground, standing in any part of the forest preserve, and poplar timber of such size as the forest commission might determine, the proceeds to be devoted to the purchase of the lands within the Adirondack park.

It was and still is believed by the friends and advocates of establishing a system of forestry management in America, that the timber thus designated could be cut and removed without permanent injury to the forests, and that a large and constant revenue might be thus secured to the State—more than sufficient to defray the expenses of an efficient and liberal forestry administration. To this end had the friends of forestry been laboring for years—and their efforts were thus crowned by adequate legislation. The future seemed bright, with the promise that title to the remaining portion of the 2,807,760 acres included within the great park would surely and within a reasonable time vest in and be under the complete control of the State, there to continue perpetually as a forest preserve, and without demand upon the taxpayers for its administration or maintenance. This seemed a most happy solution of the forestry problem in New York. It only remained to administer the laws wisely and efficiently; and this the Forest Commission set about doing. But before results could be realized from their labors in this direction the Constitutional Convention, in the summer of 1894, adopted an article forever prohibiting the cutting or disposing of any trees or timber on lands owned or thereafter to be owned by the State; and the people ratified this action at the polls in November.

This blocks the practical forestry movement in New York for the next twenty years, unless an amendment to the constitution doing away with this article be, in the meantime, submitted to and ratified by the people of the State—a contingency not likely to happen.

So stands the forestry legislation in New York—pledged to forest protection but constitutionally opposed to forest utilization.

It is not surprising, however, that the people took a firm stand against every kind of lumbering on the public domain, when we consider the fact that destruction and waste have so generally followed its operations—that fire and flood have so often swept away what the lumbermen left, devastating whole districts and towns.

And then, too, we must remember that for more than a decade past we have necessarily been raising the cry of alarm against the ruthless lumbering that has so rapidly depleted our

forests—against the criminal waste and devastation thereby caused; that we have strenuously sought to inculcate a strong sentiment in favor of the protection and preservation of trees and forests; that the almost universal celebration of Arbor day annually arouses general enthusiasm among the people for planting and protecting trees, and at the same time creates a bitter opposition against their destruction; that the people, therefore, do not understand how applied forestry, as carried on by the governments of Europe, can possibly conserve the forest.

The State of New York can protect her forests without the necessity of depending upon an income therefrom. She is financially strong, and her people say that they are willing to pay the bills. She is committed to the policy of purchasing and securing control of the remaining forest lands within the Adirondack park, and thus to preserve for all time the great watershed and the rivers and streams flowing therefrom. What a magnificent forest will the State own twenty years hence, if she succeeds in securing the protection she promises.

Fire is our most formidable enemy to forest protection. For the year ending in June, 1880, according to the U. S. census, the loss from forest fires in the State of New York alone aggregates over $2,000,000—a sum more than sufficient to have purchased, at the prices then prevailing, all the lands lying within the borders of our present Adirondack park. Legislation quickly followed, and under the system adopted and carried forward by the State authorities, the returns for 1893, which appear quite complete and reliable, show that 10,137 acres were burned over during that year, with a loss or damage of $11,825; that there were 24 fires, 8 of which were caused by railroad locomotives, 6 by clearing land, 2 by incendiaries, 1 by hunters, 1 by berry pickers, and 6 by causes unknown.

The forest commissioners of New York, under the authority given by the State, have done most effective work in protecting the forests of the State against destructive fires. It is to be hoped that no effort in this direction will abate in the future.

New York, in comparison with other States and Territories, stands foremost, in proportion to her wooded area, in the prevention of forest fires.

New York's forest policy, under the present constitution, is to increase the protection she now affords them, acquire title

to the lands of her important watersheds, and to encourage, by wise legislation, private owners to foster and protect their forest holdings.

NORTH DAKOTA.

By W. W. BARRETT, Vice-President, Church's Ferry.

We have nearly 460,000 acres of native forests or timber in North Dakota, which are located mainly along the Missouri and the Red rivers and their numerous branches, on the Mouse and the James rivers, and at Devil's Lake and the Turtle Mountains. Much of these woods have been thinned out by the axe and thousands of acres destroyed by fires. The yearly consumption for fuel, fencing and building purposes is largely in excess of the annual growth. We have fifty varieties or kinds of trees, eighteen bushes and ten creepers and vines, all natives of our woods. We have twenty kinds of wild fruit of fine quality, and our forest seeds, acorns, nuts and wild fruit amount to many car loads each returning year. All our trees uninjured by the fire will compare favorably with like varieties in size and quality to those in adjoining States. Our cultivated trees amount to nearly 40,000 acres, and millions of self-planted trees—Poplars, Cottonwoods, Boxelders, etc.—are now growing on our virgin prairies, where none were seen in 1880-82, at which time the pioneers began to exclude the prairie fires. There is a gradual increase of cultivated forest trees.

There is really no active forestry association or associations in our State. But much interest has been awakened and maintained in our commonwealth for the last six years in the question of forestry by means of press notices and the reports emanating from the Department of Irrigation and Forestry.

OREGON.

By E. W. HAMMOND, Vice-President, Wimer.

The condition of the forests of this State has not, perhaps, changed materially from what it was when the forestry report for the Tenth Census was made.

The area under forest is estimated at about 16,000,000 acres, or a little more than one-fourth of the area of the entire State. The great commercial forests, however, which mainly occupy the Coast and Cascade ranges and portions of the intervening valleys, occupy a much less area than this, or, in round numbers, about 10,000,000 acres (16,000 square miles).

The merchantable timber upon this latter area has been estimated at 400,000,000,000 feet, board measure.

The annual output is now estimated at about 200,000,000 feet. But even this amount must be insignificant in comparison with the amount annually decaying, and, in a sense, going to waste in the forests through natural causes.

In many places, even about the settlements, one will see numbers of the very largest and handsomest pine trees—in every respect magnificent specimens, 200 to 250 years old and more—dead and dying, that must go to waste because of the entire absence of any means of converting them into lumber.

The annual output, in fact, represents an amount equal to about 10 per cent. only of the annual new growth of these forests; whence it follows (if the condition of the forests is stationary) that an amount equal to 90 per cent. of this new growth is annually going to waste.

This means, in other words, that if the mature timber could be culled annually from the forests of this State, these forests could be made to yield annually about 2,000,000,000 feet, board measure, without detriment to the forest.

In the opinion of the writer what is needed most here just now is, first, some efficient regulation in regard to forest fires; second, proper measures to prevent the gobbling up of large tracts of the more valuable portions of our forests by private corporations, where lumbering operations are liable to be carried on without reference to future needs or to any future condition of the country.

The general sentiment here is as yet far from being sufficiently alive to the importance of this subject. So many interests would like to share in the general prosperity that would follow the working, on any adequate scale, of the great forests of this State, that public sympathy, it is only too well feared, would be with any movement of that kind, and the future needs or the future condition of the country would receive no attention except at the hands of the few.

Indeed, any active interest in forestry here has gone but little beyond that of individual effort. Some slight recognition has been accorded it by the State Horticultural Society. One or two other societies, chiefly in the interest of the preservation of the game and of forest recreation, have taken a somewhat active interest in the subject. The value and importance of the forestry movement, however, has been recognized by the last two legislatures in the matter of joint resolutions to Congress and the President asking the establishment of forest reservations and some proper protection for the same.

PENNSYLVANIA.

By Dr. J. T. Rothrock, State Forest Commissioner, Harrisburg.

The cause of forestry is making a slow but healthy growth in this State. It is true that all the legislation hoped for this winter will not be successfully accomplished; this, however, is owing in great part to financial stress, which has not only depleted the State treasury, but at the same time increased the demands upon it.

The public press throughout the State has with a singular unanimity declared for the forestry cause. The legislature has just passed and the Governor signed a bill creating a department of agriculture. In this forestry appears as a prominent bureau, with a fairly liberal appropriation for its work, and with the opportunity of creating public sentiment by lectures over the State at farmers' institutes. The Pennsylvania Forestry Association is in a growing, healthy condition, the interest of the members is more real than ever, and we may confidently expect in a very short time to inaugurate the two most needed features of forestry reform, namely, efficient general fire laws and State forestry reservations.

The Report of the Forestry Commission has just been completed and handed in to the legislature. It has about 600 pages of manuscript, a number of maps, and 44 photographic illustrations, and though the time was too short to produce a really

scientific or exact report, yet it is hoped that enough of information has been gleaned to give a still further impulse in favor of the forestry cause.

During the year 1894 there were sold for taxes in Pennsylvania not less than 1,500,000 acres of stripped timber lands, on which the owners refused to pay taxes. The actual damage from forest fires was probably between one and a half and two million dollars. The bridges swept away during the last four years along the valley of the West Branch and Juniata cost to replace about $800,000. Probably 25 per cent. of the State is in productive timber lands.

The heaviest lumbering operations now are in Sullivan, Elk, McKean, Forest, Warren and Clearfield counties. There are not more than one-half dozen considerable sized bodies of original White Pine left in the State. The best of these are in Clearfield, Warren and Forest counties. The tendency to reproduction of White Pine in this State is very marked, and we might have hope, by this time, of a second growth crop if the fires had been kept out since the time of the original cutting.

The largest lumbering interest in the State is, of course, the Hemlock. An enormous quantity of the lumber is sent into the market at a very low figure, simply because the trees were felled in order to obtain the bark. It is safe to say that the industries, including the lumber, which may be regarded as a biproduct, are worth to the State at this time about $12,000,000 annually. This industry can hardly endure more than fifteen years if the present rate of destruction of Hemlock is maintained.

We have had considerable bodies of Black Spruce in the State. One in Centre county, at Bear Meadows, has been wholly destroyed. It is doubtful if any finer specimens of the tree grow anywhere in the United States than were produced there.

Along the higher mountain axis of the State, in Pike and Wyoming counties, along the waters of Mehoopany creek, from some cause, not yet fully understood, the spruce has been dying at a rate which suggests early extermination. The facts would seem to indicate that the cause is of fungal origin, but more careful investigation is needed to determine this fully.

SOUTH DAKOTA.

By Dr. L. McLouth, Vice-President, Brookings.

The only forestry areas of any size in this State are in the Black Hills, in the western and less thickly populated part of the State. I am told that many of these forestry areas have been considerably stripped of their timber by the miners, who need the material for their mining operations. There is also a strip of timber along the valley of the Missouri river extending a part of the way through the State, varying in size from simply a fringe of bushes to a strip of Cottonwood and elm timber in some cases a mile in width. There are also a few isolated patches of timber either along some of the smaller streams or in the neighborhood of some of the larger lakes. Most of this timber, however, has suffered much because of the encroachments of the neighboring settlers, who want the material either for building or for fuel. Some of the Indian reservations, which primarily had considerable timber, have been nearly stripped, either by the Indians themselves or by the neighboring whites.

Under the tree claim law considerable areas were, ten or a dozen years ago, planted with trees, and many of these groves have been preserved, and some of them have so grown as to be now of use in furnishing fuel to the farmers from the trees that naturally die each year. In a far larger number of cases, however, neglect and the almost certain fires that sweep over the prairies every year have entirely destroyed or greatly injured these tree plantations.

I think that the custom of celebrating Arbor day, which is annually appointed by the Governor, is becoming more general. But usually the plantations upon that day are apt to be of ornamental shrubs or of trees that are near to the house, and not in the way of systematic tree plantations.

I might be permitted to add that the Agricultural College has been very much interested in this matter, and, located as we are upon the prairies, where there is no timber at all, we have planted considerable areas of our land with forest trees of a great many kinds. More than a hundred thousand forest

trees have been planted within the last six years, and we are cultivating them, and they are, in the main, growing and thrifty. The Experiment Station has also issued several bulletins upon the subject of forestry matters, and these bulletins have been widely distributed.

TEXAS.

By W. Goodrich Jones, Vice-President, Temple.

Less than a fifth of our State is wooded. The principal forests are of pine, and situated in a rather narrow belt in the northeastrn part of the State, running down as far as Houston and not as far west as Dallas. Plenty of timber abounds in the river bottoms, and in some sections of the State, as the north central portion, stretches of Post Oak make an occasional appearance. Cedar abounds rather plentifully all over the State except in the western half. I regret to say the cedar is rapidly being destroyed by the ravages of fire and by the hand of man, it being used as fire wood and for posts. As it is a very tedious growth, the time is not long distant when a substitute must be looked for. Posts eight feet long of cedar now sell at from 7 to 10 cents apiece. The river bottom land is rapidly being cleared of its timber for the purpose of cultivation. Innumerable sawmills are at work in the pine forests, and the destruction of timber is immense, without the least foresight being given to the future. I owned 1500 acres of pine forest land, which I sold some ten years ago at $4 an acre; the value of the land today would be between $10 and $15. However, I presume that I could buy the same land back for a small consideration, as there is, no doubt, now nothing left but the stumps. Throughout the central and west central part of our State I found great numbers of the Pecan tree, the finest pecans seeming to come from Brownwood and San Angelo, whose elevation is between 1000 and 1500 feet above the sea. Cypress is plentiful on the river bottoms and in the Sabine Pass country.

All our State papers recognize the great benefits that would accrue to the State from a forestry commissioner and forestry

laws, but the people as a rule are very apathetic in their interest. We have a State Horticultural Association, composed mostly of fruit growers, who are gradually building up a sentiment and an interest in forestry matters. The writer was instrumental in the creation of Arbor day in the State, and for seven or eight years has been hammering away through the papers on forestry subjects. I think there has been an awakening and a real interest in forestry matters, but the light burns very dim as yet. Our great effort is to have a forestry commissioner appointed, which, however, cannot be gotten through the present legislature. The cities of the State are alive to the subject of tree planting, and wonderful progress has been made in that line in the last decade. The most prolific and abundant tree in the State seems to be the Hackberry, which has few insect enemies, is long lived, and stands the drought better than any tree I ever saw. It is largely used in the cities as a shade tree. The Live Oak is also very abundant, and in some portions of the State is heavily draped with gray moss.

VERMONT.

By Hon. Redfield Proctor, Vice-President, Proctor.

There is a slow but steady growth of public sentiment in favor of preserving the forests from the reckless destruction which has been so common in the past. It is also true that more and more of our lands—the lighter soils and steep hillsides—once cleared but now of little value for cultivation, are allowed to run up to wood. Where the forests are cut now for wood or timber the land is rarely cleared, but is allowed to grow up again, and in our State the growth is very rapid, so that in 25 or 30 years after a lot is cut off there is a second growth, which would yield from 30 to 50 cords to the acre. Land which has been cleared, and cultivated or pastured, will, if stock is kept out, seed itself, and soon run up to wood. I think the wood acreage in Vermont is increasing rather than diminishing, so that the evils resulting from denuded hillsides and decreased water supply are no longer on the increase.

In some sections of the State, especially in Pomfret and the vicinity in Windsor county, there has been a systematic and intelligent planting of trees on the steeper lands where the first fertility has been exhausted and the surface is liable to wash. These hillsides, planted as they are with Sugar Maple, will within a generation give a good growth of wood for cutting for fuel, but will doubtless be allowed to stand, as they will be more valuable to stand for sugar orchard than to cut for wood.

WEST VIRGINIA.

By Prof. A. D. Hopkins, Vice-President, Morgantown.

No one who has traveled through the interior of West Virginia and observed the square miles of virgin forests of spruce, hemlock, oak, yellow poplar, pine, etc., can doubt the immense wealth in this one of her important natural resources. Some of the existing conditions with reference to this natural wealth may be stated as follows:

Within the last ten years millions of dollars of capital from other States and countries have been invested in West Virginia timber and timber lands. The price of such land has rapidly risen from 50 cents to $10 and to $20 per acre. Most of the timber accessible to large streams and railroads is now owned by individuals and companies who have located large manufacturing plants, and are operating. Railroads are being rapidly pushed into the heretofore inaccessible interior; streams are being cleared out and splash dams built to facilitate the transportation of timber to the mills. Lands and timber which three or four years ago were considered of little value, on account of their distance from means of transportation, are now being purchased by New York, Pennsylvania, Michigan and other operators, who are seeking new forests to conquer. In fact, the forests are being invaded by a threatening and destructive army of lumbermen, who are locating their camps at advantageous points, and the work of real destruction com-

menced only a few years ago is being prosecuted with renewed energy every day, and from present indications there is no prospect of abatement until our State is robbed of her forest wealth.

I have studied existing conditions where the timber has been removed, and have observed the devastation caused by unwise methods of clearing land, by fire and by insects, and after a due consideration of these existing conditions, as viewed from different standpoints, I see but little present possibilities for introducing methods that would bring about a better condition. It appears to be an unavoidable evil. Capitalists have their money invested in expensive plants, which must be kept in operation or lose them money. They are, as a rule, shrewd business men, but interested more in present gains than future prospects.

There are yet areas of virgin forest in our State, fifty to one hundred square miles in extent, which, if they could be preserved in their natural condition, would be a lasting benefit for our people.

With reference to present and future possibilities of forestry in West Virginia, I would say that it is yet possible for individuals, the State or the United States government, to secure by purchase, areas of considerable extent for timber reserves and State or national parks. In this way, and this only, can they be protected from the devastation that is now in progress on their borders.

In the settled regions of the State there are thousands of small tracts of land, or fields, upon which the owners are spending more energy and money to keep the sprouts down each year than the returns from the crops grown thereon will justify. The problem of reforesting such land is a simple one. It is only necessary for the owners to leave the sprouts to grow. In most instances these so-called sprouts consist of young pine, hickory, oak, chestnut, walnut, cherry, etc., which would soon grow into useful timber.

In the White Pine regions, where most of the large timber has been removed, seedling pines are springing up in great profusion. Here it is only necessary to prevent the destructive outbreaks of forest fires to have this land produce in time another crop of pine timber. Much of the spruce territory would

reproduce successive crops of spruce in the same manner, and we may say the same of the hemlock, oak and other valuable kinds of timber. Therefore I agree with the opinion often expressed by others, that the primary methods to be sought for by those who are interested in reforesting such lands, are those of protection, especially against forest fires.

WISCONSIN.

By H. C. PUTNAM, Vice-President, Eau Claire.

The State of Wisconsin organized a State Forestry Association in 1893. It has this winter procured the passage of bills in the State legislature providing for foresters and charge and care of the forests, fire protection, the circulation of instructions among the settlers and farmers within the whole north half of the State, or forest area.

The forest of Wisconsin is represented by a line drawn across the State in a northwest direction from near Milwaukee to the St. Croix river, or western boundary of the State, with occasional dips to the south, as on the Black and Red Cedar rivers, and a large body of hardwood land along the Kickapoo river, south of the middle of the State—an area of nearly 23,000,000 acres, and with the forests south of this line (one million or more acres besides), a vast forest area. From this area, of course, there has been cut and removed four-fifths of the White Pine forest, but this removal does not impair the forest proper if fires are not allowed to run, as the proportion or number of pine trees per acre over this forest area was or is small when compared with the other kinds of timber; so that we may say the forest proper of Wisconsin is not impaired as such. If proper care is now exercised there is left a vast amount of hemlock, cedar, tamarack, oak, maple, linden, elm and other varieties. Wisconsin is really the base of supply for the prairie States south and west adjoining. Wisconsin has the only hemlock forest in the west from the Mississippi river to the western slope of the Rockies. In Washington there is but little, and that very poor in quality and not easy to reach on the mountain sides.

Mixed in with the State and private holdings of lands in said forest area the general government has something near a half million acres yet unsold, not desirable or of value for agricultural purposes, and not especially valuable for timber at present, but as a part of the forest. The government should either turn said land over to the State and let it become a part of the proposed State forest reserve, and cared for as such, or provide for its care and preservation.

The three great feeders or tributaries of the Mississippi river are in Wisconsin, and have their sources and main bodies in the forests of Wisconsin, to-wit, the Wisconsin, Chippewa and St. Croix. The Wisconsin forest, where are gathered and stored the rains and snows whose slow discharge so tempers and controls the floods of spring, protects these rivers. The preservation of the forest of Wisconsin so that it may continue for all time to thus guard and control the lower river is a great national question, of even greater importance than to the State itself.

I recommended in our State Forestry Association that the State retain the fee and soil of its some 600,000 acres unsold, and acquire from the United States all the land in said forest area still owned by the government, and invite and urge owners of forest area to quit-claim to it any surplus land that owners may have from which they have removed the pine timber, and which really is of a nominal value to said owners, and thus to add all possible area to the State's holdings, and then carefully estimate and sell the ripe timber, and so keep the main forest conditions intact.

NOTES ON THE NEW PUBLIC FORESTS NEAR BOSTON.

By CHARLES ELIOT, of Olmstead, Olmstead and Eliot, Landscape Architects to the Metropolitan Park Commission, Boston, Mass.

A summary account of the origin, the character and the administration of the first large woodland reservations established in the United States at the *expense of co-operating municipal treasuries* will not be unwelcome at this meeting; although it is to be premised that economic or profit-making forestry can only be incidentally illustrated in reservations created primarily for enjoyment and recreation.

ORIGIN.

About one-fourth of the total area within ten miles of the Massachusetts State House is salt water, while the dry land of the other three-fourths of the circle is divided into thirty independent towns and cities. The population of the district has increased rapidly of late—some of the towns having gained in numbers at the rate of two hundred per cent. in ten years. The consequent destruction of once lovely rural landscape has, of course, been very noticeable.

Since 1870 an active and numerous association of lovers of scenery and natural history—the Appalachian Mountain Club—has had headquarters in Boston. By invitation of the governing body of this club a public meeting was held in Boston on May 24th, 1890, at which, most parts of the State being represented, an influential committee was appointed to endeavor to obtain from the general court, or legislature, "the establishment of a board of trustees capable of acquiring and holding for the public beautiful and historic places in Massachusetts." The efforts of this committee were successful, and the Trustees of Public Reservations were created by special act of the legislature of 1891. Impressed by the critical situation of some of the loveliest places in the State, the executive com-

mittee of this trustee board petitioned the general court of 1892 as follows:

"The undersigned petitioners respectfully represent that the seashores, the river-banks, the mountain-tops, and almost all the finest parts of the natural scenery of Massachusetts are possessed by private persons, whose private interests often dictate the destruction of said scenery or the exclusion of the public from the enjoyment thereof. In the opinion of the undersigned, the scenes of natural beauty to which the people of the Commonwealth are today of right entitled to resort for pleasure and refreshment, are both too few in number and too small in area; and, therefore, your petitioners respectfully ask that an inquiry be instituted by your honorable bodies for the purpose of ascertaining what action, if any, may be advisable in the circumstances."

The same executive committee also induced the local park commissioners, the Appalachian Mountain Club, and many citizens of the district about Boston, to address the legislature thus:

"The undersigned petitioners respectfully represent that the seashore, the river-banks, the hill-tops, and the other finest portions of the scenery of the district surrounding Boston, to which the people have long been accustomed to resort for healthful pleasure, are now being converted to the private purposes of their owners, to the great detriment of the present population and the irreparable loss of succeeding generations. Wherefore your petitioners respectfully request your honorable bodies to institute, through a special commission or otherwise, a comprehensive and impartial investigation of the whole subject of providing ample open spaces for the use and enjoyment of the increasing population of the Boston metropolitan district."

The result was the denial of the general suggestion of the trustees' committee, but the granting of the petitioners' prayer so far as the neighborhood of Boston was concerned. An inquiring commission, headed by Mr. C. F. Adams, and assisted by an enthusiastic secretary, a lawyer and a landscape architect, after studying the whole field, reported to the legislature of 1893 a draft of an act for the creation of a permanent and executive "metropolitan park commission," endowed with power to purchase or condemn lands for public reservations within a defined metropolitan district, without regard to municipal boundaries, and at the charge of a loan to be issued by the Commonwealth, but repaid by the cities and towns of the district before the bonds fall due. This report met with popular

favor, it was earnestly supported before the committees at the State House, the desired legislation was enacted, and the executive Metropolitan Park Commission began its labors in the summer of 1893. The lands acquired for preservation in the two years which have now passed may be summarily described as follows:

1st. An important addition to the already long "parkway" of the city of Boston, by which it is extended to the summit of the highest hill within the city limits, and thence down into a wild valley, where is the source of an important brook. This is Stony Brook reservation, consisting of 475 acres in Boston and Hyde park.

2nd. Three miles of sea beach in the township of Revere fronting Massachusetts bay, and but twenty minutes distant from the heart of Boston.

3rd. One hundred and ninety acres chiefly of salt marsh, on the banks of the tidal portion of Charles river, in Boston, Cambridge, Newton and Watertown, which, with similar lands already owned by Cambridge and by certain semi-public institutions, will in the future compose a riverside park eight miles in length.

4th. Two small areas endowed by nature with remarkable and contrasting beauty—one the hemlock gorge at the Upper Falls of Charles river, about 50 acres of picturesque land and water lying in Newton, Wellesley and Needham; the other, the Beaver Brook ponds, falls and great oaks, 58 acres in Waltham and Belmont.

5th. Two large wooded areas, one south and one north of Boston; first, Blue Hills reservation, comprising about 4000 acres in Canton, Milton, Quincy and Braintree; second, Middlesex Fells reservation, containing about 3000 acres of land and water in Malden, Medford, Winchester, Stoneham and Melrose. These last are the public forests which are the subject of these notes.

CHARACTER.

Blue Hills reservation, as finally outlined by existing or proposed boundary roads, is about five miles long and one mile wide. The lowest point within the bounds is about 75 feet

above sea level; the highest, 640. Half a dozen summits exceed 400 feet. The hills consist of rounded domes of granite generally veneered with a very hard quartz porphyry. Cambian slate is found in the broader valleys. Glacial drift is spread over all, causing confused drainage and many swamps, even at high levels. One pond, Hoosicwhisick, covers 25 acres. The swamps, large and small, occupy ten per cent. of the total area. The summit regions, where the soil is thin and the ledge outcrops, may foot up five per cent. The remaining area consists chiefly of more or less steep slopes of gravel or clay, often strewn with stones.

It is on these last named slopes that the forest, such as it is, finds place. It consists, for the most part, of a coppice or stump-growth of oak and chestnut. Here and there is a surviving White Pine, or even a group thereof; but, speaking generally, the growth is monotonous, varying only in the height of the sprouts, according as the last private owner may have cut over his wood lot lately or years ago. The swamps and the high ledges alone break the monotony of these woods; the first being clothed with Red Maples and Gray Birches, or very rarely with White Cedars; while the latter bear Red Cedars, Pitch Pines occasionally, Chestnut Oaks frequently, and Scrub Oaks always. The dense thickets of the latter bush on some of the hilltops are almost impassable.

Such being the general character of the Blue Hills forest, a few of the exceptional localities may next be mentioned. West and south of Hoosicwhisick pond stretches a level sand-plain, mostly clear of trees. North of the same pond lies a beautiful open valley of grass land, on the borders of which stand most of the few fine trees of the reservation. East of Balster brook is an old pasture now filling up with beautiful growths of Bayberry, Highbush Blueberry and Red Cedar. In Ponkapog pass are several ancient clearings containing the remains of old orchards. Similar abandoned clearings and house sites are found in Randolph pass and in Braintree pass. On Buck hill and on Breeze Hill are the only two considerable bodies of seedling forest within the reservation, these slopes having once been pastures where now self-planted trees are forty feet high.

Middlesex Fells reservation is about two and one-half miles square. Half of this area belonged to various municipal water

boards before the Metropolitan Commission took possession of the remainder. This reservation consists, not of a range of hills, but of a plateau, the surface of which is much diversified by rock and gravel swells, innumerable small hollows, and several broad troughs containing natural or artificial sheets of water of very irregular outline. These ponds and reservoirs occupy about fourteen per cent. of the total area.

The base of the steep edge of the plateau is from 50 to 100 feet above sea level. Many knobs of the surface reach 200 feet or over. Two summits rise a little above 300 feet. Glacial rubbish is strewn all about, but the ledge rocks protrude through it at countless points. These underlying and protruding rocks consist of felsite in the southeast, then in succession fine granite, coarse granite, metamorphic slate and quartzite mixed; and in the northwest, diorite. The geology, like the topography, is very complex.

In its own way the vegetation of the Fells is also exceedingly varied. In the Blue Hills the forest can, as we have seen, be classified as that of the swamps, the slopes and the summits. In the Fells swamps, ledges and gravel slopes are inextricably and most intimately mixed. Moreover, the lower elevation of the region and its proximity to a whole circle of towns has caused human activity to produce in the woods a far greater variety of modifications than are to be noted in the Blue Hills. A considerable, but as yet not accurately determined, part of the total area has at one time or another been treeless pasture, or perhaps cultivated land. Even the highest summit, Bear Hill, is today a pasture, now beginning to be covered with Red Cedars and naturalized Barberry bushes. The hickories, oaks and other seedling growths, which eventually spring up in such once cleared places, make the best trees and the best woods of both reservations, and because the original clearings were much more numerous in the Fells than in the Hills, fine trees and woods are much more common in the former than in the latter reservation. Much of the woodland of the Fells is indeed a sprout growth of oak (chestnut is uncommon here), but it is much more frequently broken by swamps or abrupt ledges, by groves of White Pine or hemlock, by patches of grass or bushy pasture, by bodies of seedling woods filling abandoned fields.

It appears, then, that the primitive forest long since disappeared from both reservations, that the present woods are not a natural so much as an artificial product, and that they are beautiful and promising of future and lasting beauty not where sprouts have been periodically cropped, but only where the killing or removal of the stumps has made it possible for a new growth to spring once more from seed.

ADMINISTRATION.

It is to be noted that the object had in view in making these two woodland reservations was simply the refreshment and recreation of the people of the adjacent crowded towns. It follows that the question for the managers is not how much financial profit, but how great a dividend of pleasure can be economically obtained from the public domains.

The enjoyment which townspeople find in such places springs in part from the fresh air, the comparative solitude and the mere change of scene; but it springs also from a mysterious but most positive influence which the beauty of landscape exercises upon most persons. It may, therefore, be set down as a guiding principle in managing these reserves that they are to be kept as wild and as unlike towns as is compatible with the resort to them of hundreds or thousands daily, and that the beauty and variety of their scenery is to be not only preserved, but, if possible, enriched and enhanced.

So far as the preservation of the woodland scenery is concerned, the principal enemy to be feared is fire. Before the establishment of the reservations the Fells and the Blue Hills had both been frequently over-run by leaf fires, which destroyed the fallen foliage before it had time to enrich the soil by its slow decay. In the Blue Hills the accumulations of woodchoppers' rubbish and fallen dead-wood provided fuel which converted leaf fires into conflagrations about once in every ten years, and caused the killing to the ground of many hundred acres of vigorous woods. At the time of the "taking," many hundred acres of such burnt woods were standing dead in various parts of the Blue Hills. Most of the stumps threw out new shoots during the first or second season after the fire, but the dead trunks and limbs, standing, falling and fallen,

presented a hideous spectacle in general views from the hills as well as close at hand, and threatened still hotter fires should a spark fall among them. Accordingly, during the first winter of the Commission's control of the land, all these burnt districts were sub-divided or isolated by removing the dead wood from strips of ground averaging 200 feet in width and burning it. For safety's sake the Fells reservation was sub-divided in the same way—that is, by the removal of inflammable material from numerous broad strips, which strips were chosen so as to take advantage, when possible, of wood paths, stone walls, swamps, ledges or other helpful circumstances. During the second winter the area of the intervening blocks of uncleaned woods was considerably reduced in the Blue Hills and nearly extinguished in the Fells, so that there is now but little danger of a "leaf or ground fire" becoming a destructive "crown fire." During the past six months ten fires have started in the two reservations, but they have been quickly put out by the small force of patrolmen who are employed to serve as guides, watchmen and police officers. These men are each assigned to a particular district; they meet each other at certain times and places each day, while morning, noon and evening finds each of them at a commanding view-point from which smoke would be discoverable should it chance to rise. The ordinary fire tools, water cans, brooms, etc., are stored in numerous scattered boxes.

During the past six months these patrolmen have found it necessary to make sixteen arrests, mostly for carrying firearms or shooting. As foxes, squirrels, quail and partridge have long abounded in these woods, it would not be remarkable if the suppression of shooting should require several years and many more arrests.

That the new reservations may return to the metropolitan community such dividends of refreshing enjoyment as will justify their cost, it has been understood from the first that the beauty of the forest scenery must be not only safe-guarded, but also restored, developed and enhanced, and at the same time made accessible by roads which shall not be grossly disfiguring. In order to make the most of every scenic opportunity, insure harmonious results and to secure the attainment of the ends in view with all possible economy, it was obvious from the

start that well considered and comprehensive general plans would need to be prepared, adopted and adhered to. Such plans should be in hand before the living growth is touched or the building of permanent roads begun. On the other hand, such plans cannot be well devised without thorough preliminary study of both the forestal and the topographical conditions, and the Commission has, accordingly, made liberal provision for the collection of the present facts in both departments.

To enable the study of the forests to be prosecuted intelligently, sketch maps were cheaply prepared during the winter of 1894, or immediately after the lands were acquired. These maps, drawn to the scale of 500 feet to the inch, delineated the boundaries, wood roads, streams and swamps of the reservations with remarkable accuracy, considering that they cost—field work, draughting, tracing and sun-printing included—only about 10 cents per acre. Reproduced in colors by photolithography at a reduced scale, they served to illustrate the annual report issued in January, 1895, as well as for distribution to interested citizens. The lithographed copies have been particularly useful to a corps of some forty botanists who, by invitation of the Commission, have been engaged in exploring the reservations during the present summer and the last. Sunprints from the original tracings of the sketch maps have also been used in the systematic study and mapping of the present condition of the various types and sections of the woods. By the close of the present year it is expected that these records of the present facts will be completed and a preliminary botanical list published. Mr. Warren H. Manning, as chief assistant of the landscape architects, Messrs. Olmsted, Olmsted and Eliot, has had immediate direction of these preliminary forest studies.

To obtain the equally necessary topographical information the Commissioners made a contract with Messrs. French, Bryant and Taylor, engineers and surveyors, who agreed to furnish topographical maps drawn to the scale of 100 feet to the inch, showing woods, large trees, fields, swamps, streams, ledges and contours five feet apart, for a fixed price of $2.85 per acre for the map of the Blue Hills and $2.60 per acre for the map of the Fells. These surveys have been making while the forest studies have been going on. The contracting surveyors are to supply the Commission with both paper sheets and tracings

of the maps, and it is on lithographs to be made from the drawings and on sun-prints to be made from the tracings that the landscape architects will presumably delineate and describe the works to be eventually executed by the Commission's forester and engineer respectively.

The general plans to be thus devised upon the basis of the present facts will doubtless be drawn with reference to that more or less distant time when thousands of people will resort to the public domain every day or week. On the other hand, the progress to be made in the execution of the plans from year to year may be as slow or rapid as seems best. The plans will place the roads so as to exhibit the scenery of the reservations to the best advantage, and the forest scenery will, in time, need to be planned in detail, with special reference to the roads as points of view. The nice work of opening vistas, inducing screens or thickets, strengthening the planting of foregrounds and the like, will necessarily be postponed until the permanent roads are built, or, at least, roughed out. In the forester's department only general work will be in order at first. The purpose of the plans for this general work will be to restore destroyed beauty, rescue jeopardized beauty, insure more lasting beauty, increase the variety of beauty and emphasize the more remarkable types of beauty exhibited by the various sections of the woods. Thus, for some rocky summit the plans may suggest the encouragement of the characteristic Pitch Pine, scrub oaks and Bearberry, and the removal of incongruous maples and the like. For the sake of variety, it may be planned that some of the existing openings should be preserved by pasturing with sheep, or that from other fields hay should be taken annually for feeding the sheep in winter. Where on smooth land, which once was pasture, seedling trees are now jostling each other too closely, the plan may read: "Sell standing the trees which are crowding the spreading oaks, leaving enough of the younger trees to take the place of the veterans fifty odd years hence." Again, in those many places where scenery is now smothered by monotonous thickets of sprouts from chopped or burnt stumps, the general plan may perhaps read thus: "When first marketable, sell standing two-thirds of these sprouts, killing the stumps. Sell the remaining sprouts after seedling trees shall have become well established." Further

illustration of the nature of the general plan is unnecessary. With such a plan guiding both the woodland work and the construction work, effective, co-operative and harmonious results can be economically secured. Without a plan both kinds of work will become mere temporizing, and no consistent and effective final result can be expected.

For the effective execution of the work to be done in the reservations in accordance with the general plans it is to be expected that the Commission will secure as head keeper of each public forest a man acquainted with the flora and fauna of the woods, a good manager, competent to devise economies and to discover sources of income, skilled to direct road repairs, as well as woodland work; fitted also to serve as the captain of the necessary patrol and as paymaster of the patrolmen, the road laborers and the woodsmen. Under each head keeper there will naturally be needed a foreman or foremen in charge of road maintenance and a foreman or foremen of woodcraft. The keepers and some of their assistants will presumably be provided with houses situated within the reservations, and to these forest lodges the public will be invited to resort when in need of shelter or supplies for picnicing. Over the head keepers, and in general command during the period of active work, there will naturally be placed two executive officers, reporting directly to the Commission, a forester and an engineer, each of whom should be willing and eager to co-operate with the other and with the devisers of the general plans, to the end that the scenery planned to be preserved, restored or created, may be eventually and surely secured. If consistent and fine results are to be attained, the engineer must be ever ready to subordinate his special works for the sake of the general effect or "landscape," and the forester must likewise be willing to work in the same spirit. Administered in these ways by sufficiently active men, the forest scenery may, in a few years, be restored to that fortunate state the beauty of which, barring fires and other accidents, is inevitably increased by the passage of time.

NOTE.

The legislation of Massachusetts, which has led to the grand forest park system of the city of Boston, and is intended to encourage the establishment of forest parks in other communities, is comprised in the following Acts, which may well serve as a pattern for other communities:

May 21, 1891, Chap. 352.—An Act to incorporate the trustees of public reservations; the incorporators to hold real estate worthy of preservation for the enjoyment of the public to the extent of $1,000,000, such lands to be exempt from taxation for at least two years.

1892, Chap. 342.—Creates a Metropolitan Park Commission of three persons, appointed by the Governor, to serve for one year from May 1, 1892, to make report on expediency of selecting plans for laying out "ample open spaces for the use of the public."

May 3, 1893, Chap. 300.—Authorizing any board of park commissioners in towns to include streets in their parks and to levy taxes for the purpose of improving the same.

June 3, 1893, Chap. 407.—Establishing a permanent Metropolitan Park Commission of five persons, to be appointed by the Governor, for the purpose of establishing by exercise of eminent domain, if necessary, or otherwise, and for preserving public reservations; the means to be provided by the issue of scrip in the name of the Commonwealth, to an amount not exceeding $1,000,000, for a term not exceeding forty years; the maintenance expenses not to exceed $20,000.

April 21, 1894, Chap. 288.—An Act authorizing the Metropolitan Park Commission to construct roadways and boulevards.

June 3, 1895, Chap. 450.—An Act defining in detail the powers and duties of the Metropolitan Park Commission.

June 2, 1896, Chap. 453.—An Act reiterating the policy of public park construction.

June 4, 1896, Chap. 465.—An Act to better define the authority of the Metropolitan Park Commission; especially with reference to the use of roadways included in reservations and for transferring the control of such reservations to any city, town or county, and for co-operation in establishing parks.

June 4, 1896, Chap. 466.—An Act increasing the amount of money to be placed at the disposal of the Metropolitan Park Commission.

June 9, 1896, Chap. 550.—An Act limiting the time within which the park system is to be perfected to the year 1900, and providing for the maintenance expenses for the future.